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ABSTRACT

A mail survey of Nebraska fire departments/districts was conducted during summer 1983 to assess the human and physical resources available to them with special emphasis on equipment and protective clothing needed in pesticide-related emergencies. It also assessed general preparedness for responding to agrichemical emergencies, particularly those involving pesticides, and determined the scope of experience in responding to pesticide-related emergencies. Oxygen supplies for medical emergencies were carried by 27 percent of the firefighting vehicles; 70 percent had a medical emergency kit available. In approximately 6 of every 10 departments, less than half of the personnel had completed an Emergency Medical Technician, Firefighter First Aid, or equivalent course. More than half of the departments had special equipment (self-contained breathing apparatus, chemical suits) available for use in contaminated environments. Most departments assigned personnel without training on how to deal with special situations (e.g., chemical fires) and reported spending four hours or less in-service training time on that same topic within the past three years. Few departments reported that significant percentages of their personnel had certificates, diplomas, or degrees in firefighting or related areas. Most responses to calls during 1982 involving pesticides were located in rural areas. (YLB)

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ASSESSING PESTICIDE IMPACT ON HUMAN HEALTH IN NEBRASKA:

A Survey of Fire Departments

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ASSESSING PESTICIDE IMPACT ON HUMAN HEALTH IN NEBRASKA:

A SURVEY OF FIRE DEPARTMENTS

by

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SUMMARY

A mail survey of 483 Nebraska fire departments/districts was conducted during the summer of 1983 to:

1) assess the human and physical resources available to the departments/districts with special emphasis on equipment and protective clothing that could be needed in pesticide-related emergencies;

2) assess general preparedness for responding to agrichemical emergencies, particularly those involving pesticides;

3) determine the scope of experience in responding to pesticide-related emergencies.

Completed questionnaires were returned by 335 (69%) of those surveyed.

Fractionally more than three-fourths of Nebraska's fire departments are based in communities having 2,500 or less population, and 95% of all departments are staffed by all-volunteer personnel. More than 95% of the departments served fire districts extending beyond the base community; driving distance to the farthest point in the district exceeds 11 miles for over half of the department. The 911 common emergency telephone number is available to less than 30% of the communities.

Oxygen supplies for medical emergencies are carried by 27% of the firefighting vehicles, but 70% have a medical emergency kit available.

However, in approximately six of every 10 reporting departments, less than half of the personnel have completed an Emergency Medical Technician, Firefighter First Aid or equivalent course. More than half of the departments have special equipment (e.g. self-contained breathing apparatus, chemical suits) available for use in contaminated environments.

Survey results showed that while the level of firefighter training is generally good across the state, there are some deficiencies. Most departments assign personnel to engine companies without training on how to deal with special situations (e.g. chemical fires). Similarly, most departments reported spending four hours or less in-service training time to that same topic within the past three years. Relatively few of the departments reported that significant percentages of their personnel had received certificates for attending the Nebraska Fire School, and fewer still reported personnel having received doplomas or other academic degrees for completing formal courses in firefighting or related areas. Respondents were nearly unanimous in indicating that if additional in-service training on pesticide and chemical-related emergencies were available, they would want their perosnnel to participate.

Nebraska fire departments had answered calls during 1982 involving both pesticides and other chemicals with most of the responses to rural areas. Fire and resultant property damage was reported in several cases as well as instances of personal injury or death. Respondents also reported cases in which firefighters had become incapacitated in the line of duty as a result of exposure to pesticides.

INTRODUCTION

Pesticides are used extensively in agricultural states such as Nebraska. Results of one recent study in that state[1] revealed that more than 30 million pounds of pesticide active ingredient were applied for field crop use in 1982. Manufacturing[2], transporting, storing, mixing, loading, and applying such large quantities of pesticide presents a potential for accidents.

Although variable in degree, all pesticides are toxic. Some are also corrosive or flammable. While the majority of pesticides used in Nebraska are relatively low in toxicity, some widely used pesticides are extremely hazardous. Any accident involving such a pesticide poses special problems. Emergency response personnel must be prepared to use special precautions in such a situation. Appropriate preservice education and training as well as timely in-service training is essential.

In order to assess the capacities of both health services and emergency support personnel to cope with pesticide-related accidents/incidents, as well as their need for new in-service educational resources on such emergencies, a comprehensive assessment was begun in late 1981. The study undertaken at that time was the first comprehensive effort to: document the number of pesticide-related accidents and incidents in Nebraska; assess the capacity of health services resources (ambulance services/rescue squads, hospitals, physicians) to

provide required services in pesticide-related emergencies; evaluate emergency support resources (fire departments, law enforcement agencies) in responding to such situations; and assess the need for new in-service educational resources for both health services and emergency support professionals.

The assessment of pesticide impact on human health in Nebraska is a collaborative effort integrating resources of the Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln and the University of Nebraska Medical Center, Omaha. The project was funded through a grant from the National Agricultural Pesticide Impact Assessment Program, Extension Service, U.S. Department of Agriculture.

In addition to the survey of Nebraska fire departments reported in this publication, surveys of physicians, hospitals, ambulance services/rescue squads, and law enforcement officers also were conducted and are reported separately.

METHODS AND PROCEDURES

Sample Design

According to information provided by the Nebraska State Fire Marshal, there were 483 fire departments in the state at the time of the study. An individual fire department, for purposes of this survey, was defined as all available firefighting personnel and equipment serving a given community or fire district without regard to the number of stations at which those resources might be physically located. All

fire departments in the state were included in the sample.

Survey Instrument

The instrument for this study (Appendix 1) was designed to elicit information on operating parameters of individual fire departments (personnel, equipment, training, etc.) and determine the experience of departments in responding to pesticide-related emergencies.

An initial draft was written after consultations with the Nebraska State Fire Marshal; representatives of the Nebraska Fire Service, Division of Vocational Training, Nebraska State Department of Education; the chairman of the Fire Science and Technology Department of Southeast Community College, Lincoln; and the training chief of the Lincoln Fire Department. Resource persons also served as external reviewers of the draft questionnaire. Internal reviewers for IANR included: the Coordinator of Environmental Programs, the Pesticide Training Coordinator, and the Pesticide Impact Assessment Specialist.

The printed questionnaires included a three-digit number in the upper right corner of the first page. The number was used solely as a control in facilitating follow-up mailings, and its purpose was explained in the cover letter which accompanied the questionnaires.

Data Collection and Survey Response

A questionnaire, cover letter (Appendix 2) and post-paid return envelope were mailed to 483 fire departments in late June 1983. The initial mailing produced 227 responses, or 47% of the sample. The 256 nonrespondents were sent a second mailing eight weeks after the first

that included a copy of the questionnaire, a revised cover letter (Appendix 3) and post-paid return envelope. That mailing produced 108 additional responses (22% of the original sample) over a seven-week period. Because the 335 questionnaires that were returned represented responses from 69.4% of the surveyed population, data collection efforts were terminated and the questionnaires were sent to the IANR Biometrics and Information Systems Center for computer tabulation and analysis.

FINDINGS AND DISCUSSION

Paralleling the state's population pattern, nearly 90 percent of Nebraska's fire departments are located in communities under 5,000 population, and more than three of every four are in communities of 2,500 or less (Table 1).

Table 1

Population of Nebraska Communities Having Fire Departments

Population	Number	%
2,500 or less	255	76.1
2,501 - 5,000	39	11.6
5,001 - 15,000	24	7.2
15,001 - 50,000	12	3.6
50,000 or greater	2	0.6
No Response	3	0.9

More than 95% of the responding departments reported that the district served extended beyond the geographical limits of the community in which the department was based (Table 2A). The majority of departments responding to the survey reported driving distances of 11-20 miles. Some instances were reported in which distances exceed 30 miles; and according to anecdotal information furnished, districts of three respondents exceeded 50 miles (Table 2B).

Table 2

Limits of Nebraska Fire Districts

A.

Fire Districts Extend Beyond Community Limits

	Number	%
Yes	320	95.52
No	12	3.58
No Response	3	0.90

B.

Driving Distances To Farthest Point in District

Distance	Number	%
Less than 5 miles	16	4.78
5 - 10 miles	112	33.43
11 - 20 miles	147	43.88
21 - 30 miles	36	10.75
Over 30 miles	15	4.48
No Response	9	1.19

A majority of Nebraska fire departments are staffed by an all-volunteer force. Of the 335 units that returned questionnaires, 318 (95%) were all-volunteer departments. Only four departments were staffed totally by full-time professionals (Table 3).

Table 3

Staffing of Nebraska Fire Departments

Staffing	Number	%
All volunteers	318	94.93
Some full-time professionals, most volunteers	9	2.69
Most full-time professionals, some volunteers	4	1.19
All full-time professionals	4	1.19

It was also found that the 911 common emergency telephone number had been adopted and implemented in less than one-third of Nebraska's communities (Table 4). This finding corroborates an earlier survey of ambulance services and rescue squads in which the same question was asked; the percentage of affirmative responses to the question differs by less than two percent between the two surveys.[3] Lack of funding and lack of agreement on protocols that would govern operations of the service were cited by a spokesperson for the Nebraska Telephone Association as the leading reason why more communities have not adopted the 911 number.[4]

Table 4

Nebraska Communities Using 911 Common Emergency Telephone Number

	Number	%
Yes	98	29.25
No	232	69.25
No Response	5	1.49

Unlike schools, hospitals and nursing homes that must be inspected periodically by fire officials, there is no state requirement for periodic inspections of pesticide storage facilities (e.g. the warehouse of a local retailer). Local community ordinances may, however, require such inspections.[5] In response to a survey item on inspections, 130 departments (39%) reported that routine inspections were made at pesticide storage facilities and other high fire hazard sites located within the respective districts (Table 5).

Table 5

Nebraska Fire Departments
Conduct Routine Inspections
of Pesticide Storage/High Hazard Sites

	Number	%
Yes	130	38.81
No	201	60.00
No Response	4	1.19

Because the fumes of some pesticides are highly toxic, a question also was asked on the number of firefighting vehicles equipped with oxygen supplies for medical emergencies. Only 93 respondents (28%) reported that the vehicles in their districts were so equipped (Table 6A). On a related question, however, 235 respondents (70%) said the vehicles were equipped with medical emergency kits (Table 6B).

Table 6

Oxygen/Medical Kit Availability
On Nebraska Firefighting Vehicles

	A. Oxygen Supplies Available		B. Medical Aid Kits Available	
	Number	%	Number	%
Yes	93	27.76	235	70.15
No	236	70.45	96	28.66
No Response	6	1.79	4	1.19

Use of a self-contained breathing apparatus and chemical suits could be necessary in some pesticide-related emergencies; e.g. while extricating a fumigant poisoning victim from a flat storage grain bin or in controlling a fire involving a pesticide warehouse. A majority

of respondents (182, 54%) said their departments are equipped to cope with such emergencies (Table 7).

Table 7

Chemical Suits/Breathing Apparatus Available on Nebraska Firefighting Vehicles

	Number	%
Yes	182	54.33
No	140	41.79
No Response	13	3.88

Another sequence of questionnaire items focused on training issues. In the majority of cases, fewer than half of the department personnel were reported to have completed an Emergency Medical Technician (EMT), Fire Fighter First Aid, or equivalent training course (Table 8). This sharply contrasts with results of the earlier survey of ambulance services and rescue squads of Nebraska. According to respondents in that study, fire departments operated approximately 70% of the state's ambulance services and rescue squads and 72% of the respondents claimed that 75% or more of their personnel held EMT certification.[3]

Table 8

Emergency Medical Aid Course Completed by Nebraska Firefighters

Percentage	Number	%
100%	11	3.28
75 - 99%	56	16.72
50 - 74%	68	20.30
25 - 49%	92	27.46
Less than 25%	104	31.05
No Response	4	1.19

Preservice training in responding to special situations such as chemical fires also was investigated. Less than 40% of the respondents reported that their firefighters receive training on procedures or methods to be used in such situations before they are assigned to an engine company or unit (Table 9).

Table 9

Special Situation Preservice Training Given to Nebraska Firefighters

	Number	%
Yes	126	37.61
No	193	57.61
No Response	16	4.78

In addition, relatively few respondents reported that significant numbers of personnel (i.e. 25% or more of all personnel) had attended the Nebraska Fire School. A total of 147 respondents (44%) reported that only 1-24% of their personnel had attended the school, and another 56 (17%) said none of their personnel had participated in the training (Table 10). The fire school is a 12-hour training course conducted annually in central Nebraska (Grand Island) during a three-day period. Participants can select from 25 different courses, and are awarded a certificate of completion at the end of the training. The Nebraska Fire Service (a part of the Division of Vocational Education, Nebraska State Department of Education), the Nebraska Volunteer Firefighters Association, the Nebraska Forest Service, and the National Fire Academy present the training in conjunction with additional agencies and organizations.

Table 10

Personnel Attended
Nebraska Fire School

Percentage	Number	%
76 -100%	22	6.57
50 - 75%	50	14.93
25 - 49%	55	16.42
1 - 24%	147	43.88
None	56	16.72
No Response	5	1.49

More extensive courses are offered through Nebraska's community college system. Successful completion of a two year program leads to award of an Associate of Applied Science Degree in Fire Protection Technology. Only 11 respondents (<4%) reported that a significant percentage of their personnel (i.e. 25% or more) had received an associate degree or higher diploma for completing a formal academic program in firefighting or another related area (Table 11).

Table 11

Nebraska Firefighters Completing
Degree or Diploma Programs

Percentage	Number	%
76 -100%	1	0.30
50 - 75%	6	1.79
25 - 49%	5	1.49
1 - 24%	57	17.02
None	259	77.31
No Response	7	2.09

Survey results also showed that relatively little attention apparently was given during in-service training to pesticide/chemical fires, spills and related emergencies. Responding to a question concerning the hours of in-service training that had been devoted to that topic during the preceding three years, 213 departments (66%) reported devoting some time to the topic. Eight hours or less were spent on the subject during that 36 month period by 134 departments, or 40% of all respondents. Fractionally more than a third of the departments devoted no time to the topic (Table 12).

Table 12

In-Service Training (3 years)
on Pesticide-Related Emergencies
For Nebraska Firefighters

Hours	Number	%
16 or more	16	4.78
9 -15	63	18.81
5 - 8	54	16.12
1 - 4	80	23.88
None	112	33.43

The Nebraska Fire Service of the State Department of Education and the Nebraska State Fire School were the most frequently cited sources of the in-service training (Table 13).

Table 13

Sources of In-Service Training
For Nebraska Firefighters

Source	Number
National Fire Academy	13
State Fire Marshal	37
Nebraska Fire Service/ State Dept. of Education	112
Nebraska State Fire School	117
Community College	15
Other	46

The concluding questions on training address the issue of new in-service training opportunities that would relate specifically to pesticide/chemical emergencies. An item asking whether they would want their personnel to participate if such a program were available was answered by only 219 of the respondents. Of these, 218 responded affirmatively (Table 14).

Table 14

Interest of Nebraska Firefighters In New In-Service Training on Pesticide/Chemical Emergencies

	Number	%
Yes	218	65.08
No	1	0.30
No Response	116	34.63

The Nebraska Fire Service of the State Department of Education, the Nebraska State Fire School and the office of the State Fire Marshal, in order, were the most preferred sources of program delivery if such training were to be presented (Table 15).

Table 15

Preferred In-Service Program Sources For Nebraska Firefighters

Source	Number
National Fire Academy	17
State Fire Marshal	71
Nebr. Fire Service/ State Dept. of Education	201
Nebraska State Fire School	82
Community College	16
Independent study materials	60
Other	7

Data also were gathered on pesticide- and chemical-related emergency responses in Nebraska. Of the respondents who completed the survey, 14 reported answering pesticide-related calls (Table 16A). While not all indicated the total number of calls answered, eight departments reported one call, two reported two calls and one reported four calls. There were 41 departments reporting calls involving chemicals other than pesticides (Table 16B). A total of 20 pesticide-related emergency responses to rural areas were reported with 13 in urban areas (Table 16C). Six respondents said that fire was a factor in a pesticide-related emergency to which they had responded. Property damage estimates ranged from $1,000 up to $30,000. In another case, the property damage reported included loss of an airplane. Three instances were reported in which one or more persons were injured or died as a result of the pesticide-related emergency (Table 16D). A total of eight such victims

Table 16

Pesticide/Chemical Emergency Responses
In Nebraska - 1982

A. Pesticide Call(s)

	Number
Yes	14
No	321

B. Other Chemicals

	Number
Yes	41
No	294

C. Response Site

Site	Number
Rural	20
Urban	13

D. Property Damage/Human Injury

	Number
Fire was a factor	6
Injury or death	3
Age:	
Under 5 yrs	2
6 - 12 yrs	1
13 - 19 yrs	0
20 or over	5

were reported; five were adults, two were children under five years of age and one was in the 6-12 age category.

Seven fire departments returning the survey reported one or more of their personnel had become ill or incapacitated as a result of exposure to pesticides in the line of duty. Treatment at the scene, consultation with a physician without hospitalization, and hospitalization were alternatives listed in a followup question; each elicited three affirmative responses (Table 17).

Table 17

Firefighter(s) Exposed to Pesticides
In Line of Duty

	Firefighter Ill/ Incapacited		Treated at Scene		Physician Consulted		Firefighter Hospitalized	
	Number	%	Number	%	Number	%	Number	%
Yes	7	2.1	3	1.0	3	1.0	3	1.0
No	306	91.3	27	8.0	24	7.2	25	7.5
No Response	22	6.6	305	91.0	308	91.9	307	91.6

ANALYSIS

Cross tabulation of responses to the survey revealed a positive correlation between community population and the staffing of fire departments. With only one exception, the fire departments in communities of 5,000 or fewer population were exclusively volunteer organizations. Of the 335 survey respondents, 318 were all-volunteer units; only four of the remaining 17 were all professional units. Two of those were located in communities over 50,000 (i.e. Omaha and Lincoln) and two were located in communities in the 15,001 - 50,000

population category (Table 18). The organization-type variable was skewed so extremely that purposeful analysis was precluded. Accordingly, the population variable was used as a basis for analyzing four broad characteristics of the fire departments: responsiveness, equipment and resources, training and prevention, and responses to pesticide/chemical calls.

Table 18

Fire Department Organizational Structure
And Community Population in Nebraska

	Organization			
Population	All Volunteer	Some Professional/ Most Volunteer	Most Professional/ Some Volunteer	All Professional
2,500 or less	255	0	0	0
2,501 - 5,000	38	1	0	0
5,001 - 15,000	18	4	2	0
15,001 - 50,000	4	4	2	2
50,000 or more	0	0	0	2
No Response	3	0	0	0
TOTAL	318	9	4	4

Responsiveness

Ability of the department to be summoned via the 911 common emergency telephone number, extension of the geographical limits of the fire district beyond the community, and reported driving distance to the district's farthest point were analyzed under the rubric of "responsiveness."

In general, the 911 common emergency telephone number is not available to most persons residing in the vicinity of Nebraska's smallest communities (i.e. those having populations of 2,500 or less).

Emergency assistance can be contacted in this way in only one of every five Nebraska communities in this population category. A majority -- in some cases, a substantial majority -- of the communities in all other population categories has the emergency alerting system available (Table 19A).

As noted earlier, over 95% of the fire districts in Nebraska extend beyond the boundaries of the community in which the department is located, and predictably nearly 75% (246) are served from communities in the 2,500 or less population category (Table 19B). It is the departments in these districts that also report having the longest driving distances to the farthest points in the districts. As the table indicates, 151 respondents reported those distances as ranging from 11 up to more than 30 miles (Table 19C). Because time is usually critical, this fact could have serious implications in the event of a pesticide-related emergency.

Equipment and Resources

An emergency oxygen supply is likely to be needed in a pesticide-related emergency in which a victim was exposed to an organophosphate, carbamate or fumigant. Respiratory depression, which may be severe particularly where fumigants are involved, is a common symptom of poisoning by these types of pesticides. A victim exhibiting this symptom will need oxygen support to maintain life.

Table 19

Responsiveness

Population	A. 911 Availability			B. Fire District Boundary			C. Driving Distance to District Boundary					
	911 Available			Extends Beyond Community			Driving Distance (Miles)					
	Yes	No	No Response	Yes	No	No Response	<5	5-10	11-20	21-30	>30	No Response
2,500 or less	50	200	5	246	7	2	9	88	116	26	9	7
2,501 - 5,000	21	18	0	38	1	0	1	7	19	7	5	0
5,001 - 15,000	15	9	0	23	1	0	4	7	9	3	0	1
15,001 - 50,000	10	2	0	10	2	0	1	9	1	0	1	0
50,001 or over	2	0	0	0	1	1	1	0	0	0	0	1
No Response	0	3	0	3	0	0	0	1	2	0	0	0
	98	232	5	320	12	3	16	112	147	36	15	9

Approximately one in every four fire departments in the state carries an oxygen supply for medical emergency use (Table 20A). Only 93 (28%) of the survey respondents answered the question affirmatively. A reason for this may be that fire departments in the majority of Nebraska communities also operate the ambulance/rescue squad service in the area and oxygen is carried on that vehicle.[3] Fire departments in the 2,501-5,000 population category were least likely to have oxygen supplies available; only 7 (18% of the communities in this population category) reported having oxygen available.

Conversely, on a statewide basis, seven of every 10 fire departments reported that they carry a medical emergency kit. Cumulatively, 235 departments (70% of all respondents) said each firefighting vehicle was so equipped. In the state's smallest communities (i.e. 2,500 population or less) however, the margin was slightly smaller; in those communities only two of every three vehicles are so equipped (Table 20B).

Self-contained breathing apparatus could be required during efforts to extricate a fumigant poisoning victim (e.g. from a grain bin) while chemical suits might be needed by personnel attempting to contain a fire at a pesticide warehouse or storage facility. Such special equipment was reported to be available to fractionally more than half of all respondents (182, 54%). Departments from communities in the 5,001-15,000 and 15,001-50,000 population categories were most likely to have special equipment available for operations in a chemically contaminated environment; three-fourths of the respondents from those communities responded affirmatively to this item (Table 20C).

Table 20

Equipment and Resources
Of Nebraska Fire Departments

Population	A. Oxygen Available			B. Medical Aid Kit Available			C. Special Equipment Available		
	Yes	No	No Response	Yes	No	No Response	Yes	No	No Response
2,500 or less	68	183	4	171	80	4	126	118	11
2,501- 5,000	7	32	0	28	11	0	25	13	1
5,001-15,000	10	13	1	21	3	0	18	6	0
15,001-50,000	7	5	0	11	1	0	9	3	0
50,001 or over	1	0	1	2	1	0	1	0	1
No Response	0	3	0	2	1	0	3	0	0
	93	236	6	235	96	4	182	140	13

Training and Prevention

In general, fire departments in the state's smallest communities reported having participated in the least amount of formal training.

Of the 255 units serving communities in the 2,500 or less population bracket, only 88 (approximately 35%) reported that half or more of their personnel had successfully completed an Emergency Medical Technician or Firefighter First Aid course. The percentage of fire departments in which this level of training has been reached increases at each successively larger population bracket. On a statewide basis, approximately 40% of the fire departments report that half or more of their personnel had completed such a first aid course (Table 21A).

Similar results were found with respect to special situation training - i.e. methods and procedures for controlling chemical fires or other situations that present special hazards. In the smallest communities, slightly less than one-third of the departments reported that such training was presented before assigning a new person to an engine company or unit. Again, more of the departments in communities from the larger population brackets reported giving such training, but statewide the percentage was only slightly more than one-third (Table 21B).

Only 72 (or approximately 21%) of the 335 departments represented in the survey reported that half or more of their personnel had received certificates for attending the Nebraska Fire School. Approximately 13

Table 21

Training*
Of Nebraska Fire Departments

A.
EMT or Firefighter First Aid Course Completed

Community Population	100%	75-99%	50-74%	25-49%	<25%	No Response
2,500 or less	2 [0.8]	35[13.7]	51[20.0]	71[27.8]	92[36.1]	4[1.6]
2,501 - 5,000	0 [0.0]	9[23.1]	9[23.1]	14[35.9]	7[18.0]	0[0.0]
5,001 - 15,000	4[16.7]	8[33.3]	3[13.5]	7[29.2]	2 [8.3]	0[0.0]
15,001 - 50,000	4[33.3]	3[25.0]	4[33.3]	0 [0.0]	1 [8.3]	0[0.0]
50,000 or greater	1[50.0]	1[50.0]	0 [0.0]	0 [0.0]	0 [0.0]	0[0.0]
No Response	0 [0.0]	0 [0.0]	1[33.3]	0 [0.0]	2[66.7]	0[0.0]
	11 [3.3]	56[16.7]	68[20.3]	92[27.5]	104[31.0]	4[1.2]

B.
Pre-Service Special Situation Training Given

Yes	No	No Response
80 [31.4]	165[64.7]	10 [3.0]
19 [48.7]	18[46.2]	2 [5.1]
17 [70.8]	5[20.8]	2 [8.3]
6 [50.0]	4[33.3]	2[16.7]
2[100.0]	0 [0.0]	0 [0.0]
2 [66.7]	1[33.3]	0 [0.0]
126 [37.6]	193[57.6]	16 [4.8]

C.
Attended Nebraska Fire School

76-100%	50-75%	25-49%	1-24%	None	No Response
10 [3.9]	25 [9.8]	39[15.3]	124[48.6]	54[21.2]	3[1.2]
1 [2.6]	9[23.1]	11[28.2]	15[38.5]	1 [2.6]	2[5.1]
8[33.3]	8[33.3]	3[12.5]	5[20.8]	0 [0.0]	0[0.0]
2[16.7]	7[58.3]	1 [8.3]	2[16.7]	0 [0.0]	0[0.0]
0 [0.0]	0 [0.0]	0 [0.0]	1[50.0]	1[50.0]	0[0.0]
1[33.3]	1[33.3]	1[33.3]	0 [0.0]	0 [0.0]	0[0.0]
22 [6.6]	50[14.9]	55[16.4]	147[43.9]	56[16.7]	5[1.5]

D.
Completed Firefighting Degree/Diploma Program

Community Population	76-100%	50-75%	25-49%	1-24%	None	No Response
2,500 or less	1[0.4]	4 [1.6]	1 [0.4]	37[14.5]	207 [81.2]	5[2.0]
2,501 - 5,000	0[0.0]	1 [2.6]	2 [5.1]	2 [5.1]	33 [84.6]	1[2.6]
5,001 - 15,000	0[0.0]	0 [0.0]	1 [4.2]	11[45.8]	11 [45.8]	1[4.2]
15,001 - 50,000	0[0.0]	0 [0.0]	0 [0.0]	7[58.3]	5 [41.7]	0[0.0]
50,000 or greater	0[0.0]	1[50.0]	1[50.0]	0 [0.0]	0 [0.0]	0[0.0]
No Response	0[0.0]	0 [0.0]	0 [0.0]	0 [0.0]	3[100.0]	0[0.0]
	1[0.3]	6[1.8]	5[1.5]	57[17.0]	259 [77.3]	7[2.0]

E.
In-Service Training Hours (3 Years) Conducted on Pesticide Emergencies

16 or more	8-15	5-8	1-4	None	No Response
6 [2.4]	40[15.7]	39[15.3]	59[23.1]	103[40.4]	8[3.1]
2 [5.2]	5[12.8]	8[20.5]	16[41.0]	7[18.0]	1[2.6]
2 [8.3]	11[45.8]	5[20.8]	5[20.8]	0 [0.0]	1[4.2]
3[25.0]	6[50.0]	2[16.8]	0 [0.0]	1 [8.3]	0[0.0]
1[50.0]	1[50.0]	0 [0.0]	0 [0.0]	0 [0.0]	0[0.0]
2[66.7]	0 [0.0]	0 [0.0]	0 [0.0]	1[33.3]	0[0.0]
16 [4.8]	63[18.8]	54[16.1]	80[23.9]	112[33.4]	10[3.0]

F.
Additional Training Desired

Yes	No	No Response
148 [58.0]	1[0.3]	106[41.6]
31 [79.5]	0[0.0]	8[20.5]
24[100.0]	0[0.0]	0 [0.0]
11 [91.7]	0[0.0]	1 [8.3]
2[100.0]	0[0.0]	0 [0.0]
2 [66.7]	0[0.0]	1[33.3]
218 [65.1]	1[0.3]	116[34.6]

*Bracketed numbers are row percentages. Percentages are rounded to one decimal place and therefore may not total 100%.

percent of the departments in communities in the 2,500 or less population bracket reported that half or more of their personnel had received certificates from the school, while departments in most other population brackets reported significantly larger percentages. The exception was in the 50,000 and greater bracket (Omaha and Lincoln); fire departments in both cities have their own training divisions (Table 21C). Greater participation in the Nebraska Fire School may be prohibitive for persons in many of Nebraska's fire departments. As noted earlier, the overwhelming majority of the state's fire departments are all-volunteer units, and many of the smaller communities are located in the western part of the state. The time that would be needed away from one's business or place of employment for both travel and attendance at the school may make participation prohibitive for many persons who otherwise would attend.

Relatively few respondents reported significant percentages of their personnel having received a community college Associate of Science degree or other diploma for completing formal academic programs in firefighting or related fields. Of the 12 respondents who claimed that 25% or more of their personnel have completed such academic training, six were from communities in the 2,500 or less population category and three were from communities in the 2,501-5,000 bracket. While clearly not impossible since community colleges as well as campuses of Nebraska's state college system are scattered throughout the state, the response

does not appear to be consistent with responses to other portions of the survey that focus on training and education (Table 21D).

Pesticides or other chemical fires, spills and related emergencies were reported to have been the focus of an extensive amount of in-service training during the three years preceding the survey. The distribution of responses to this item was particularly revealing. In general, the modal groups of respondents in each population category tended to devote in-service training time to pesticide emergencies in proportion to the population bracket size. The modal group in the 2,500 or less population bracket reported no hours of in-service training while the modal group in the 2,501-5,000 population bracket reported conducting 1-4 hours training. The lineal relationship fails at this point, however, as the modal groups in each of the next larger brackets reported that they conducted 8-15 hours of training on pesticide emergencies. The Nebraska Fire School and the Nebraska Fire Service, State Department of Education, respectively, were the leading sources in delivery of that in-service training (Table 21E).

Respondents also were asked whether they would want their personnel to participate if additional in-service training were available that emphasized methods and procedures for dealing with pesticide- and chemical-related emergencies. Among those who answered the question, the response was nearly unanimous; 218 of 219 respondents answered yes (Table 21F). Preferred program delivery sources for additional in-service training, in order, were: the Nebraska Fire Service division

of the State Department of Education, the State Fire Marshal's office, and independent study materials.

Responses to Pesticide Emergencies

Although there was not a "large" number of pesticide-related emergency responses reported by the respondents for Calendar Year 1982, those that were reported usually tended to involve fire departments in the state's smaller communities - i.e. those with populations of 5,000 persons or less.

Ten of the 14 reported responses to pesticide-related emergencies were made by departments located in communities having 5,000 or less population (Table 22A). Similarly, fire departments from communities in the same population range made 25 of the 41 reported responses to emergencies involving chemicals other than pesticides (Table 22B).

While only 14 fire departments reported answering pesticide-related emergency calls during CY 1982, 33 departments completed a related sub-item asking whether the responses were to a rural or an urban area. Reexamination of the survey forms indicates the disparity probably is attributable to item sequencing. The rural-urban response sub-item followed the sub-item on non-pesticide chemical emergencies. Apparently some of the respondents who answered the latter sub-item affirmatively also completed the rural-urban sub-item (Table 22C).

Five of six responses in which fire was a factor or personal injury or death was involved and five of seven instances in which a firefighter became ill or incapacitated from pesticide exposure in the line of duty were reported by the smaller communities (Tables 22D, E).

Table 22

Emergency Responses

Population	A. Pesticide(s)			B. Nonpesticide Chemical			C. Site		
	Yes	No	No Response	Yes	No	No Response	Yes	No	No Response
2,500 or less	6	243	6	14	227	14	15	5	*
2,501 - 5,000	4	34	1	11	25	3	1	4	*
5,001 - 15,000	2	21	1	8	15	1	2	3	*
15,001 - 50,000	1	10	1	6	6	0	2	1	*
50,001 or over	1	1	0	2	0	0	0	0	*
No Response	0	3	0	0	2	1	*	*	*
	14	312	9	41	275	19	20	13	

Population	Fire			D. Victim's Age If Injury/Death Occurred					E. Firefighter Ill/ Incapacitated		
	Yes	No	No Response	5 or <	6-12	13-19	20 or >	No Response	Yes	No	No Response
2,500 or less	2	2	251	0	0	0	3	252	4	233	18
2,501 - 5,000	3	0	36	1	1	0	0	37	1	35	3
5,001 - 15,000	0	0	24	1	0	0	1	22	1	22	1
15,001 - 50,000	1	1	10	0	0	0	1	11	0	12	0
50,001 or over	0	0	2	0	0	0	0	2	1	1	0
No Response	0	0	3	0	0	0	0	3	0	3	0
	6	3	326	2	1	0	5	327	7	306	22

In a cover letter accompanying the response from one large city, it was noted that pesticide and chemical fire incidents are not reported separately. The letter stated that, "Over the past 10 years, these types of fires have occurred, resulting in large dollar loss. Injuries have occurred. Most injured were firefighters, industrial workers, and civilians living in close proximity to such fire incidents."

CONCLUSIONS AND RECOMMENDATIONS

In this study it was found that more than half of Nebraska's fire departments do not routinely inspect pesticide storage sites. More than 40 percent of the fire departments do not have self-contained breathing apparatus, chemical suits, and other equipment available to permit operations, if necessary, in a chemically contaminated environment. In addition, more than 70 percent of the departments do not have their vehicles equipped with an oxygen supply for use in medical emergencies.

Because of the accident potential stemming from the large volume of pesticides annually manufactured, moved, stored and used in Nebraska, it is therefore recommended:

1. That local and/or county governments in Nebraska require:
   a) Periodic inspection of all commercial sites where more than 500 pounds of nonliquid and/or 50 gallons of liquid pesticides are stored 90 consecutive days or more; and

b) Pesticide manufacturers and dealers to prepare alert and evacuation plans for implementation in the event of a pesticide related emergency.

2. It is further recommended that the Fire Marshal, State of Nebraska, prepare recommendations/guidance both on equipment to be maintained on firefighting vehicles in Nebraska and on preservice training that would help assure the survival of personnel responding to chemical fires, leaks, or spills, especially those involving highly toxic pesticides.

Study results further indicated that in the majority of Nebraska fire departments, fewer than half of the personnel had completed an Emergency Medical Technician, Firefighter First Aid, or equivalent course. In approximately 75 percent of the departments surveyed, only half or fewer of the personnel had received certificates for attending the Nebraska Fire School; in nearly 95 percent of the departments, only one-fourth or fewer of the personnel had received an Associate degree or other diploma for completing a formal academic program in firefighting or a related area. In addition, the majority of fire departments do not train their personnel in methods and procedures to be used in special situations such as chemical fires before assigning them to an engine company or unit. Finally, in the majority of fire departments during the three years preceding the survey, only four hours or less of in-service training time was devoted to methods and

procedures to be followed in the event of a pesticide or chemical fire, spill, leak or similar emergency. Accordingly, it is recommended:

1. That the Fire Marshal of the State of Nebraska develop and publish RECOMMENDED guidelines for both preservice and in-service training which, if followed, would insure that fire-fighters would be adequately trained to respond to fires, spills or other emergencies involving pesticides and other hazardous chemicals.
2. That the Nebraska State Fire Marshal, the Nebraska Fire Service Division of the State Department of Education, the Cooperative Extension Service, the University of Nebraska Medical Center, and other appropriate agencies and organizations, jointly work towards the following ends:
   a) Identification of suitable existing preservice and in-service training and education materials/resources on fire department responses to pesticide-related emergencies;
   b) Development of suitable new resources as may be required on that topic.

Time often is critical in emergency situations involving pesticides, especially if there has been exposure to one that is highly toxic. Any delay in responding to such a situation could have serious - even disastrous - consequences. In many Nebraska localities, however, some delay is virtually inevitable. Results of this study indicate that over half of the fire departments in Nebraska could have to travel 20

miles or more to respond to an emergency within the fire district. It also was found that the 911 common emergency telephone number is not available within the majority of fire districts.

RECOMMENDATION: That the benefits of developing and implementing the 911 common emergency telephone system be appropriately encouraged in those localities where it is not presently available.

Results of this study indicate that some fire departments in Nebraska have been required to respond to pesticide-related emergencies. Accurate analysis of the frequency, severity and nature of fires, leaks, spills and other incidents involving pesticides would provide valuable perspective in developing labelling directions, regulations on transporting, handling, storing and applying pesticide and for developing or revising safety training courses and materials.

RECOMMENDATIONS: That the Office of the Nebraska State Fire Marshal, the Department of Environmental Control, Department of Agriculture and the Cooperative Extension Service, University of Nebraska-Lincoln, work in cooperation with local fire departments to gather data over at least a two-year period on all pesticide-related responses;

that the information gathered be analyzed and made available for use in improving the level of safety associated with manufacturing, transporting, storing, handling, and applying pesticides.

This report presents findings only from the state of Nebraska and only for one year. Recent news media reports of pesticide-related accidents, not only in the U.S., but also in other parts of the world, underscore the disastrous potential that can materialize. It is imperative that fire departments, along with other emergency support services and health services resources be thoroughly prepared to respond to a pesticide-related emergency situation wherever and whenever one might occur.

RECOMMENDATION: That the Extension Service of the U.S. Department of Agriculture continue to be actively and vigorously involved in the assessment of pesticide use in both urban and agricultural settings and that additional studies similar to this one be conducted in other parts of the United States.

ENDNOTES

1. Johnson, B. B. and S. T. Kamble. 1984. Pesticide use on major crops in Nebraska-1982. Office of Environmental Programs, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln. Department Report No. 10, p 8.

2. Information furnished by the Nebraska Department of Economic Development listed nine firms that manufacture agricultural pesticides in the state.

3. Vitzthum, E. F., D. A. Olson and R. E. Gold. 1984. Assessing pesticide impact on human health in Nebraska: a survey of ambulance services and rescue squads. Department Report No. 7.

4. Information furnished through personal communication with the Nebraska Telephone Association, Lincoln, Nebraska.

5. Personal communication of author with Office of Nebraska State Fire Marshal, October 7, 1985.

UNIVERSITY OF NEBRASKA

№ 0633

University of Nebraska Medical Center

Institute of Agriculture and Natural Resources

Assessment of Pesticide Impact on Human Health in Nebraska

Firefighters Survey

Please place a check mark in the appropriate space or write your answer in the space provided for each of the following questions:

1. **What is the population of the community in which your service is based?**

   _____ 1. 2,500 or less
   _____ 2. 2,501 - 5,000
   _____ 3. 5,001 - 15,000
   _____ 4. 15,001 - 50,000
   _____ 5. 50,000 or greater

2. **Do the geographical limits of the fire district extend beyond the city limits of the community in which the department is based?**

   _____ 1. Yes (please also answer part 2a)
   _____ 2. No

   2a. **What is the driving distance from the principal location of the department to the farthest point in the fire district?**

   _____ 1. Less than 5 miles
   _____ 2. 5 - 10 miles
   _____ 3. 11 - 20 miles
   _____ 4. 21 - 30 miles
   _____ 5. Over 30 miles (please specify)_____

3. **Which of the following best describes the staffing of your fire department?**

   _____ 1. All volunteers
   _____ 2. Some full-time professionals, most volunteers.
   _____ 3. Most full-time professionals, some volunteers.
   _____ 4. All full-time professionals.

4. **Has the 911 common emergency telephone number been adopted and implemented in your community?**

   _____ 1. Yes
   _____ 2. No

5. **Does your department conduct routine inspections of pesticide storage facilities and other high fire hazard sites in your district?**

   _____ 1. Yes
   _____ 2. No

6. **Is each firefighting vehicle you operate equipped with:**

   a. an oxygen supply for use in medical emergencies?
   _____ 1. Yes
   _____ 2. No

b. a suitable medical emergency kit for use in rendering first aid when needed?

_____ 1. Yes
_____ 2. No

7. **What percentage of your firefighting personnel have successfully completed an EMT, Firefighter First Aid or equivalent course?**

_____ 1. 100%
_____ 2. 75 - 99%
_____ 3. 50 - 74%
_____ 4. 25 - 49%
_____ 5. Less than 25%

8. **Is sufficient equipment (i.e. self-contained breathing apparatus, chemical suits, etc.) available to your firefighters to permit operations, if necessary, in an environment contaminated by toxic chemicals?**

_____ 1. Yes
_____ 2. No

9. **Are your firefighters trained in methods/procedures for special situations (e.g. chemical fires) before assignment to an engine company/unit?**

_____ 1. Yes
_____ 2. No

10. **What percentage of your firefighters have received certificates for attending the Nebraska Fire School?**

_____ 1. 76 -100%
_____ 2. 50 - 75%
_____ 3. 25 - 49%
_____ 4. 1 - 24%
_____ 5. None

11. **What percentage of your firefighters have received an Associate of Science degree or other diploma for completing a formal academic program in fire fighting or a related area?**

_____ 1. 76 -100%
_____ 2. 50 - 75%
_____ 3. 25 - 49%
_____ 4. 1 - 24%
_____ 5. None

12. **Within the past three years, how many hours of *in-service* training have your firefighters received on methods/procedures to be followed in case of pesticide/chemical fires, spills or related emergencies?**

_____ 1. 16 or more (please specify) _____
_____ 2. 8 - 15 hours
_____ 3. 5 - 8 hours
_____ 4. 1 - 4 hours
_____ 5. NONE (skip to question 15)

13. **Through what source(s) was the in-service training presented?**

_____ 1. National Fire Academy
_____ 2. State Fire Marshal's office
_____ 3. Nebraska Fire Service/State Department of Education
_____ 4. Nebraska State Fire School
_____ 5. Community College
_____ 6. Other (please specify) _____

14. If additional in-service training were available that emphasized methods and procedures for responding to pesticide/chemical emergencies, would you want your personnel to participate?

_____ 1. Yes
_____ 2. No

15. What in-service training program delivery source would be preferred?

_____ 1. National Fire Academy
_____ 2. State Fire Marshal's office
_____ 3. Nebraska Fire Service/State Department of Education
_____ 4. Nebraska State Fire School
_____ 5. Community College
_____ 6. Independent Study materials (videocasette, slide-tape, handbook, etc.)
_____ 7. Other (please specify) _____

16. During calendar year 1982, did your fire department respond to any emergency calls involving:

a. pesticides (i.e. insecticides, herbicides, etc.)

_____ 3. Yes (please specify number of calls) _____
_____ 4. No.

b. chemicals other than pesticides?

_____ 1. Yes (please specify number of calls) _____
_____ 2. No

c. Please indicate in the space provided the number of pesticide related emergency responses made to:

_____ 1. rural (farm - ranch) sites.
_____ 2. urban or suburban sites.

16. d. Of the pesticide related emergencies to which you responded, please indicate the number in which:

_____ 1. fire was a factor (estimated property damage)$_____
_____ 2. one or more persons sustained injury or died (please indicate the number of victims in each of the following age categories):

_____ 1. under 5 years of age
_____ 2. 6 - 12
_____ 3. 13 - 19
_____ 4. 20 or over

17. Has any firefighter in your department ever become ill or incapacitated as a result of exposure to pesticide(s) in the line of duty?

_____ 1. Yes (complete item 21)
_____ 2. No (skip to item 22)

18. Did the pesticide exposure in the line of duty cause the person(s) to:

a. be treated at the scene?
_____ 1. Yes
_____ 2. No

b. consult a physician (without hospitalization)?
_____ 1. Yes
_____ 2. No

c. be hospitalized?
_____ 1. Yes
_____ 2. No

19. **Thank you for participating in this research study. Please indicate below if you wish to receive a summary of the study results.**

_____ 1. Yes
_____ 2. No

NOTE: All information furnished in this survey will be regarded as strictly confidential. Data will be published in summary form only. Individual responses and identities of survey respondents will not be divulged under any circumstances.

Please return questionnaires in the postpaid envelope provided or mail to: Pesticide Impact Survey, 101 Natural Resources Hall, University of Nebraska-Lincoln, Lincoln, Nebraska 68583-0818.

If you have questions about the survey or desire further information, please contact Dr. David Olson, University of Nebraska Medical Center, Omaha, (402) 559-7299; or Drs. Roger E. Gold and Edward F. Vitzthum, Institute of Agriculture and Natural Resources, 101 Natural Resources, University of Nebraska-Lincoln (402) 472-1446.

COOPERATIVE EXTENSION SERVICE

UNIVERSITY OF NEBRASKA–LINCOLN LINCOLN, NE 68583

Institute of Agriculture and Natural Resources

Reply to:

ENVIRONMENTAL PROGRAMS
101 NATURAL RESOURCES HALL
Phone: 402-472-1446

Our purpose in writing is to request your participation in a study assessing the impact of pesticide use on human health in Nebraska. This investigation is being conducted by researchers of both the Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, and the University of Nebraska Medical Center, under terms of a U.S. Department of Agriculture grant. We believe -- and hope that you will agree -- that this study may have several long-term implications for the health and safety of Nebraskans.

Previous studies show that approximately 30 million pounds of pesticide active ingredients are applied annually in Nebraska. Most is used for agriculture, but substantial quantities are also used in urban and suburban areas. We also know that some pesticide poisonings do occur. The present investigation seeks to derive a broad spectrum of data relating to the resources, both human and physical, that might be available in the event of a pesticide emergency. Another objective is to assess the needs for in-service training programs for the various categories of professionals who may become involved in responding to pesticide accident emergencies.

A 19-item questionnaire is enclosed along with a post-paid return envelope. Please complete and return the questionnaire by August 1. PLEASE NOTE: The questionnaire has a number printed in the upper right corner. This is solely to facilitate mailing list management in the event a second mailing is required. Under no circumstances will individual responses to any item in this questionnaire be released. Data collected in this study will be published in summary form only, and a copy of that summary will be furnished on request. If you wish to receive a copy, check the "Yes" response to item 19.

Thank you in advance for your assistance in this study.

Sincerely,

Roger E. Gold, Ph.D.
Co-investigator
Institute of Agriculture and Natural Resources

David Olson, M.D.
Co-investigator
University of Nebraska Medical Center

Edward F. Vitzthum, Ph.D.
Project Research Asso.
Institute of Agriculture and Natural Resources

Enclosures (2)

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE

The University of Nebraska-Lincoln The University of Nebraska Medical Center The University of Nebraska at Omaha

COOPERATIVE EXTENSION SERVICE

UNIVERSITY OF NEBRASKA–LINCOLN LINCOLN, NE 68583

Institute of Agriculture and Natural Resources

Reply to:

ENVIRONMENTAL PROGRAMS
101 NATURAL RESOURCES HALL
Phone: 402-472-1446

This is to renew our recent request for your assistance in conducting a vitally important human health study. The cover letter in that initial mailing described briefly a joint University of Nebraska Institute of Agriculture and Natural Resources and University of Nebrska Medical Center research study investigating the impact of pesticide use on human health in Nebraska. The accuracy, and ultimately, the usefulness, of this study depends on you and your colleagues throughout the state. For this reason, we urge you to take a few moments to respond to the 19 items in the enclosed questionnaire. A post-paid envelope is enclosed for your convenience in returning the completed questionnaire. PLEASE NOTE: The number printed in the upper right corner of the first page is intended for mail list management and to provide a means of identifying individuals who wish to receive a copy of the summary of this study. Under no circumstances will individual responses to any item in this questionnaire be released. Data collected in this study will be published in summary form only. If you wish to receive a copy of that summary, please be sure to check the "Yes" response in item 19.

Thank you in advance for your assistance in the research.

Sincerely,

Roger E. Gold, Ph.D.
Co-investigator
Institute of Agriculture
and Natural Resources

David Olson, M.D.
Co-investigator
University of Nebraska
Medical Center

Edward F. Vitzthum, Ph.D.
Project Research Asso.
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and Natural Resources

Enclosures (2)

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U. S. DEPARTMENT OF AGRICULTURE

The University of Nebraska-Lincoln The University of Nebraska Medical Center The University of Nebraska at Omaha